CLAIMS

WHAT IS CLAIMED IS:

1. A method for non-destructive evaluation of a specimen, comprising the steps of:

directing heat onto the specimen;

applying a force onto a surface of the specimen; and

generating an infrared image to detect the presence of a subsurface defect, wherein the application of the force onto the surface of the specimen exacerbates a thermal discontinuity proximate to the subsurface defect.

2. The method of claim 1, wherein the applying step includes decreasing air pressure in a vicinity of the specimen to change the at least one dimension of the subsurface defect.

3. The method of claim 1, wherein the applying step includes disturbing the specimen using ultrasonic, acoustic or mechanical energy.

4. The method of claim 1, wherein the applying step includes:

placing the specimen in a chamber; and

generating a vacuum in the chamber to change at least one dimension of the subsurface defect.

5. The method of claim 1, wherein the applying step includes:

placing a sealed enclosure on the surface of the specimen; and

generating a vacuum in the sealed enclosure to change the at least one dimension of the subsurface defect.

6. The method of claim 5, wherein the sealed enclosure is divided into two sections such that the vacuum generated in said generating step produces a vacuum in one of the two sections.

7. The method of claim 1, wherein said applying step includes increasing and decreasing the pressure on the specimen surface, wherein said generating step includes generating a first thermographic image when the pressure is increased and generating a second thermographic image when the pressure is decreased, and wherein the method further comprises the step of comparing the first and second active thermographic images to detect the subsurface defect.

8. The method of claim 7, wherein the generating step generates a plurality of first thermographic images and a plurality of second thermographic images over time, and wherein the comparing step is conducted by calculating the difference of the sums of the first thermographic images and the second thermographic images.

9. The method of claim 7, wherein the generating step generates a plurality of first thermographic images and a plurality of second thermographic images over time, and wherein the comparing step includes generating histograms corresponding to the plurality of first and second thermographic images and comparing the histograms for the plurality

of first thermographic images with the histograms for the plurality of second thermographic images.

10. The method of claim 7, wherein the generating step generates a plurality of first thermographic images and a plurality of second thermographic images over time, and wherein the comparing step includes mathematically correlating the plurality of first thermographic images with the plurality of second thermographic images.

11. The method of claim 7, wherein the generating step generates a plurality of first thermographic images and a plurality of second thermographic images over time, and wherein the comparing step includes viewing an image corresponding to the ratio between the plurality of the first thermographic images and the plurality of the second thermographic images.

12. The method of claim 7, wherein the generating step generates a plurality of first thermographic images and a plurality of second thermographic images over time, and wherein the comparing step includes visually comparing the plurality of first thermographic images and the plurality of second thermographic images.

13. The method of claim 7, wherein the applying step includes placing the specimen in a chamber before said generating step.

14. The method of claim 7, wherein the applying step includes placing a sealed enclosure on the specimen surface before said generating step.

15. A method for non-destructive evaluation of a specimen, comprising the steps of:

directing heat onto the specimen;

placing a sealed enclosure on the specimen surface;

applying a vacuum to at least a portion of a surface of the specimen by decreasing the air pressure in the sealed enclosure; and

generating an infrared image to detect the presence of a subsurface defect, wherein the vacuum from the applying step enlarges at least one dimension of the subsurface defect to create a thermal discontinuity.

16. The method of claim 15, wherein the sealed enclosure is divided into two sections such that the vacuum generated in said applying step produces a vacuum in one of the two sections.

17. The method of claim 15, wherein said applying step further includes the step of increasing the air pressure in the sealed enclosure, wherein said generating step includes generating a first active thermographic image when the pressure is increased and generating a second active thermographic image when the pressure is decreased, and wherein the method further comprises the step of comparing the first and second active thermographic images to detect the subsurface defect.

18. An apparatus for non-destructive evaluation of a specimen, comprising:

a heat-sensitive image generator that generates thermographic images;

a heater that increases the temperature of the specimen; and

means for applying a force to a surface of the specimen, wherein the applying means changes at least one dimension of a subsurface defect in the specimen to create a thermal discontinuity.

19. The apparatus of claim 18, wherein said heater is at least one flashlamp that directs heat to the specimen surface.

20. The apparatus of claim 18, wherein said distorting means includes:

a sealed enclosure that is placed on the specimen's surface; and

a vacuum pump that generates a vacuum inside the sealed enclosure.

21. The apparatus of claim 20, wherein the sealed enclosure is divided into two sections, and wherein the vacuum pump generates the vacuum inside the sealed enclosure in one of the two sections.

22. The apparatus of claim 20, wherein the heater is a flashlamp disposed inside the sealed enclosure to direct light to the specimen surface.

23. The apparatus of claim 18, wherein said distorting means includes:

a chamber for holding the specimen; and

a vacuum pump that generates a vacuum inside the chamber.

24. The apparatus of claim 23, wherein the chamber includes a window, wherein the heater is a flashlamp located outside the chamber and directs light through the window to heat the specimen, and wherein at least part of the image generator is located outside the chamber.

25. The apparatus of claim 23, wherein the chamber includes a window, wherein the heater is a flashlamp located inside the chamber and directs light on the specimen to heat the specimen, and wherein at least part of the image generator is located outside the chamber.

26. The apparatus of claim 23, wherein at least one of the heater and the image generator are located inside the chamber.

27. The apparatus of claim 18, wherein said heater is a lamp that continuously directs heat to the specimen, and wherein said applying means includes an attachment that couples to the surface of the specimen to apply the force.

28. The apparatus of claim 27, wherein said attachment provides the force via ultrasonic, acoustic, or mechanical energy.

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